

REMARKS

I. Introduction

Applicants submit the present *Amendment* in response to the Office Action dated April 16, 2008 (the "Office Action"). Applicants sincerely appreciate the allowance of Claims 4-8, 14, 34-45 and 47, as well as the indication that Claim 12 is directed to allowable subject matter. In response to the Office Action, Applicants have cancelled Claims 13 and 46 and have rewritten Claim 12 into independent form and made a minor amendment thereto. Applicants have also amended Claim 2 to clarify both (a) the layers that comprise the capacitor and (b) the order in which these layers are formed. In light of these claim amendments and the remarks provided below, Applicants respectfully submit that the present application is now in condition for allowance, which is respectfully requested.

II. The Claim Rejections

The only pending claims that currently stand rejected are Claims 2-3 and 9-11. In particular, Claims 2-3 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent Publication No. 2002/0190294 to Iizuka et al. ("Iizuka"). Claims 9-11 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Iizuka. Applicants respectfully submit that each of these rejections have been overcome by Applicants amendments to Claim 2. As amended, Claim 2 recites:

2. A method of fabricating a capacitor, the method comprising:
forming a lower electrode on a substrate;
forming a dielectric layer on the lower electrode; and
forming an upper electrode on the dielectric layer to provide a capacitor that comprises the lower electrode, the dielectric layer and the upper electrode;
wherein forming the lower electrode on the substrate comprises at least forming a ruthenium seed layer using atomic layer deposition on the substrate and forming a main ruthenium layer on the ruthenium seed layer using chemical vapor deposition.

In rejecting Claim 2 (before it was amended), the Office Action took the position that the lower electrode 34 of Iizuka corresponded to the ruthenium seed layer of Claim 2, that the

bottom portion of the upper electrode 36a of Iizuka corresponded to the main ruthenium layer of Claim 2, that the insulating film 38 of Iizuka corresponded to the dielectric layer of Claim 2, and that the top portion of the upper electrode 36b of Iizuka corresponded to the upper electrode of Claim 2. Applicants respectfully submit that, as amended, Claim 2 is patentable over Iizuka for at least the following four (4) reasons.

First, Claim 2 requires that the lower electrode, the dielectric layer and the upper electrode "provide a capacitor." While Iizuka does in fact disclose a capacitor, the disclosed capacitor comprises lower electrode 34, dielectric layer 35 and upper electrode 36a/36b, as opposed to layers 34/36a, 38 and 36b (i.e., the layers recited in the rejection). Moreover, it is evident that the layers of Fig. 9 of Iizuka that are identified as comprising the capacitor would not in fact operate as a capacitor, as the identified "lower electrode" comprises the actual lower electrode and part of the upper electrode, the identified "dielectric layer" comprises an insulating film in an upper region of the device, and the identified "upper electrode" comprises the remaining portion of the upper electrode. In fact, the identified "capacitor" of Iizuka has portions of the lower electrode and the upper electrode short-circuited to each other, and the identified dielectric layer is not between the electrodes. Thus, as it is clear that the identified layers of Iizuka will not "provide a capacitor" as is recited in Claim 2, the rejection of Claim 2 should be withdrawn.

Second, as amended, Claim 2 recites "forming an upper electrode on the dielectric layer." However, in the device of Figs. 9I-9N of Iizuka, the identified "upper electrode" (i.e., layer 36b) is formed before the identified "dielectric layer" (i.e., layer 38). As such, the cited portion of Iizuka also fails to disclose "forming an upper electrode on the dielectric layer" as is recited in Claim 2, but instead suggests the opposite process, namely forming a "dielectric layer" on the "upper electrode."

Third, the Office Action states that layers 34 and 36a together comprise the recited lower electrode. However, layers 34 and 36a are separated by dielectric layer 35 and hence clearly do not act as "an electrode," but instead comprise two separate and distinct electrodes, namely a lower electrode 34 and part of an upper electrode 36, as is expressly recognized in Iizuka. (*See, e.g.*, Iizuka at ¶¶ 0109-0110). Thus, the failure of the cited

portions of Iizuka to disclose a single electrode provides a third basis for withdrawal of the rejection of Claim 2.

Fourth, while Iizuka does discuss that the lower and upper electrodes may comprise ruthenium electrodes, the specific embodiment of Fig. 9 of Iizuka does not use such ruthenium electrodes. Instead, this specific embodiment uses a TiN lower electrode and a double layered TiN/W upper electrode. (See Iizuka at ¶¶ 0109-0111). There is no disclosure or suggestion of using a double layered upper electrode that comprises ruthenium, nor is there any indication that such an electrode would provide any advantages. Applicants note that if the device of Figs. 9I-9N of Iizuka does not include a double-layered upper electrode, then the device of Iizuka would not include the "upper electrode" identified in the rejection, as layer 36b would not be present. Accordingly, the rejection of Claim 2 should be withdrawn for this additional reason.

Applicants further note that one of skill in the art would not be motivated to combine Iizuka with other references in an effort to derive the method of Claim 2. In particular, the cited portions of Iizuka expressly teach that the atomic layer deposition process should be used to form the upper portion of the lower electrode that contacts the capacitor dielectric layer, while another deposition technique (sputtering or CVD) is used to form the lower portion of the lower electrode. However, this is exactly the opposite of the method discussed in Claim 2, where the atomic layer deposition is used to form a seed layer and then CVD is used to form a main layer on the seed layer. Accordingly, Iizuka in fact teaches away from the method of Claim 2.

Claims 3 and 9-11 each depend from Claim 2, and hence are patentable over Iizuka at least as depending from a patentable base claim.

In re: Kwang-hee Lee et al.
Serial No.: 10/801,208
Filed: March 16, 2004
Page 10

III. Conclusion

For the above reasons, Applicants respectfully submit that the present application is in condition for allowance, which is respectfully requested.

Respectfully submitted,



D. Randal Ayers
Registration No. 40,493
Attorney for Applicants

Customer Number 20792

Myers Bigel Sibley & Sajovec, P.A.
P.O. Box 37428
Raleigh, NC 27627
919-854-1400
919-854-1401 (Fax)

CERTIFICATION OF TRANSMISSION

I hereby certify that this correspondence is being transmitted via the Office electronic filing system in accordance with § 1.6(a)(4) to the U.S. Patent and Trademark Office on July 14, 2008.


Michele P. McMahan